WATER RESOURCES REGIONAL PLANNING PILOT STUDY
FOR
NORTH CENTRAL TENNESSEE

PHASE I

Prepared By

U.S. ARMY ENGINEERING DISTRICT, NASHVILLE
CORPS OF ENGINEERS
Nashville, Tennessee

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Nashville District

DEPARTMENT OF ENVIRONMENT & CONSERVATION

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CHAPTER 1

EXECUTIVE SUMMARY

1.1 BACKGROUND AND OBJECTIVES

The U.S. Army Corps of Engineers (USACE), Nashville District, the Tennessee Department of Environment and Conservation (TDEC), and a steering committee composed of representatives from TDEC's Water Resources Technical Advisory Committee (WRTAC) are conducting a comprehensive water resources study for the North Central Tennessee area. This project is one of two pilot studies for regional water resources planning by TDEC. The study has been split into two phases. This report presents the results of Phase I. Phase I primarily focuses on the collection of the existing background data for the study area.

The entire study is concerned in general with the existing and future water resources of the area. The objective of this phase of the study is to assess existing water source information and water source uses, document existing resource information, and develop a Geographic Information System (GIS) database for the data collected.

1.2 PROBLEM DEFINITION

The major problems typically associated with water supply relate to water quality and water quantity. Existing and potential water supply problems with the North Central Tennessee Study Area are obtaining supplies of adequate quantity from currently used sources and supplying adequate quantities of water to meet future demands.

1.3 EXISTING WATER SOURCES AND SYSTEMS

Information has been collected on existing water sources within the planning region. These sources include, but are not limited to, groundwater, surface water, and connections to other utility systems.

1.4 GEOGRAPHIC INFORMATION SYSTEM (GIS)

Data has been collected and implemented into a GIS database to house the information developed during the study. The GIS database includes basin outlines, all streams, springs,

major water lines, intake locations, water treatment plants, wastewater plants, discharge points, and utility inter-connections of the North Central Tennessee study area.

1.5 PHASE II SCOPE OF WORK

The Scope of Work for Phase II of the study includes: critical regional drought identification, completion of existing water source yield analysis, water demand projections, determination of alternative water sources, alternative water source yield analysis, identification of water demand management opportunities, and coordination of public notice and public comment opportunities.

1.6 PROPOSED GEOGRAPHIC AREA OF PHASE II

The utility districts of Portland, Westmoreland, Castalian Springs/Bethpage, Gallatin, and White House, and the geographic areas which they serve, are recommended for further investigation during Phase II of this regional planning pilot study.

CHAPTER 2

INTRODUCTION

2.1 BACKGROUND AND AUTHORITY

The U.S. Army Corps of Engineers (USACE), Nashville District, the Tennessee Department of Environment and Conservation (TDEC), and a steering committee composed of representatives from TDEC's Water Resources Technical Advisory Committee (WRTAC) are conducting a comprehensive water resources study for the North Central Tennessee area. This project serves as a pilot study for regional water resources planning by TDEC.

This study is being conducted under the Planning Assistance to States (Section 22) Authority, of the Water Resources Dev. Act of 1974, as amended. This authority allows USACE to provide technical assistance to support state preparation of comprehensive water resource development plans and to conduct individual studies supporting the state plan. TDEC is contributing fifty percent of the cost of this study. This study has been split into two phases. This report presents the results of Phase I.

2.2 SCOPE OF STUDY

The North Central Tennessee Study Area covers a five-county geographical region. Portions of Robertson, Sumner, Macon, Trousdale and Wilson counties, which include the towns of Portland, Gallatin, Hartsville, Castalian Springs/Bethpage, White House, Lafayette, and Westmoreland, are included in the study.

The study is concerned in general with the water resources of the area. The purpose of this phase of the study is to assess existing water source information and water source uses, document existing resource information, and develop a GIS database for the data collected.

The first phase of work include the following tasks: compiling general basin information within the planning region, a literature search for existing studies, data collection to establish a GIS database, and initiation of the analysis of existing source yield.

2.3 STUDY OBJECTIVES

The ultimate objective of the North Central Tennessee Water Resources Study is to develop water source alternative plans to insure that an adequate quantity of water is available to serve the area's needs (e.g., community water supplies, agricultural, industrial, critical aquatic habitat, etc.) throughout the 50 year planning period.

In this phase of the study, information has been collected on existing water sources, water use, and wastewater production within the planning region. Water sources include, but are not limited to, groundwater, surface water, and connections to other utilities. An estimate of sources used for self supplied residences has been determined. Existing demand has been determined for the current population served, number of utility connections, and the number of municipal and industrial connections. Usage for self supplied users has also been determined. Current percent of water produced that is billed, and system losses have been compiled for utilities within the planning region. Location of service lines for each utility have been identified and compiled within a GIS database. The GIS database includes basin outlines, all streams, springs, wells, aquifers, major water lines, and connections.

2.4 STUDY PARTICIPANTS

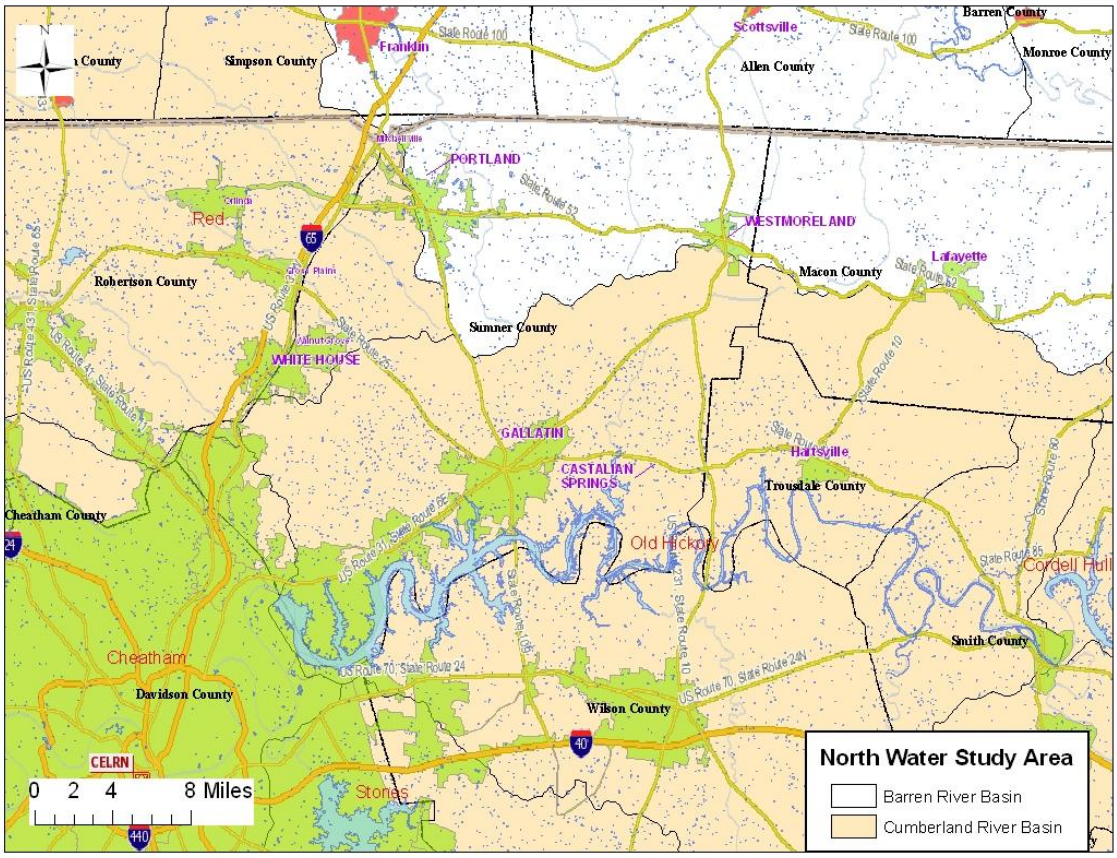
The U.S. Army Corps of Engineers, Nashville District, the Tennessee Department of Environment and Conservation and a steering committee composed of representatives from TDEC's Water Resources Technical Advisory Committee are participating together in this North Central Tennessee Water Resources Regional Planning Pilot Study.

2.5 STUDY AREA DESCRIPTION

The North Central Tennessee Study Area covers a five-county geographical region. Portions of Robertson, Sumner, Macon, Trousdale, and Wilson counties, which include the towns of Portland, Gallatin, Hartsville, Castalian Springs/Bethpage, White House, Lafayette, and Westmoreland, are included in the study. This geographical region includes parts of the Barren River Basin, Red River Basin, and Lower Cumberland River-Old Hickory Lake Basin and is shown in Figure 2.5, North Central TN Study Area. The Barren River discharges

directly into the Ohio River Basin. The Red River and Old Hickory Lake are both in the Cumberland River Basin which is a part of the Ohio River Basin.

FIGURE 2.5
North Central TN Study Area



2.5.1 Climate and Geography of Study Region

The climate of the North Central Tennessee Study Area is characterized by warm, humid summers, relatively mild winters and generally abundant rainfall. The mean annual temperature for the area is around 60 degrees. Precipitation ranges from 44 to 52 inches per year, the majority of which occurs in the winter and spring.

The elevations of the North Central TN study area range from 500’ to 900’, with portions of the area located both in the Central Basin as well as the Highland Rim. In the Central Basin, the land is relatively flat to gently rolling hills. The Highland Rim, which surrounds the Central Basin, is characterized by hilly uplands.

Hartsville, Gallatin, and Bethpage, located in the basin, have elevations of 474', 526', and 535' respectively. White House and Portland are located on the transition of the Central Basin to the Highland Rim and they have elevations of 745' and 805' respectively. Westmoreland and Lafayette are located on the Highland Rim, and have elevations of 911' and 975' respectively.

2.6 SCOPE OF STUDY FOR PHASE II

Critical regional drought periods will be evaluated for the planning region, or focus areas. The critical regional drought will be a primary factor in determining existing water source yields, as well as alternative source yields, and may be different depending upon the focus area of concern and the type (groundwater, reservoir, river, etc…) and location of the existing or proposed water source. Present and proposed drought contingency plans will be reviewed and presented as a part of the regional drought evaluation.

The existing water source yield analysis will be completed, and include an assessment of yield for peak demand as well as average daily usage. The results of the critical regional drought evaluation will be applied to the existing water source yield analyses. Possible factors affecting existing water sources such as T&E species, scenic waters, wetlands, impaired waters, and a source's location relative to other withdrawals/discharges will be described. Initiatives such as TWRA's In-stream Flow Prescriptions will be considered as limiting factors for existing water source yield where they have been defined within the focus areas. Potential threats to existing water sources will be identified.

Water demand, for the focus areas, will be projected for a period 50 years into the future, divided into increments of no more than 10 years. Three growth scenarios will be evaluated reflecting anticipated levels of growth and uncertainty in growth predictions. Local economic development goals, existing land use patterns, and official land use plans will form the basis for the projections of future residential, commercial, and industrial water use. A general, focus area-wide, ultimate land use scenario will be developed. An assessment will be made of the local government and utilities' ability to support the growth driving water supply demand with fees and tax rates

acceptable to their constituents. Water demand forecasting software from the Institute for Water Resources (IWR-MAIN) will be used to develop demand projections. An assessment will be made, and the results presented, of the likely time frame within which projected water demand will outstrip existing water source yields.

Current and proposed conservation practices will be reviewed. Possible opportunities for additional measures will be identified, and a minimum of six conservation methods including system loss reduction, conservation pricing, and other active and passive conservation methods will be evaluated. A regional water conservation plan for each focus area will be presented. The potential impact of conservation measures upon water demand projections will be determined.

Potential alternative water sources will be identified for each focus area (e.g., groundwater, surface waters, new reservoir, resized reservoir, water harvesting, etc.) and potential issues (e.g., legal, resources, etc.) associated with each source will be identified and presented.

Each potential alternative will include an analysis to determine the alternative's firm yield. The results of the critical regional drought evaluation will be applied to the alternative water source yield analyses. Possible factors affecting alternative water sources such as T&E species, scenic waters, wetlands, impaired waters, and a source's location relative to other withdrawals/ discharges will be described. Initiatives such as TWRA's In-stream Flow Prescriptions will be considered as limiting factors for alternative water source yield, where they have been defined within the focus areas. Potential threats to alternative water sources will be identified.

Conceptual level design of each alternative water source will be performed sufficient to develop material quantities and construction methods. Conceptual level cost estimates will be developed, and presented, for each alternative inclusive of anticipated engineering, design, and construction costs for each. CADD drawings will be produced for each alternative with detail sufficient to support design and cost estimating efforts.

The conclusion of this phase of the study will result in a regional planning. This regional planning report will

present a comparison of proposed alternatives, the designation of a preferred alternative (or combination of alternatives) and an implementation strategy for the preferred alternative for the focus area.

Consistent with TDEC and USACE policy, Public Notices will be issued and opportunity given for Public Comment on relevant aspects of this project.

CHAPTER 3

EXISTING WATER SOURCES AND SYSTEMS

3.1 WATER SOURCES

Principle water supplies in the North Central TN Study Area have been developed primarily from rivers, streams, and reservoirs, with small quantities of water being obtained from ground water through wells or springs. These water sources are presented in Table 3-1, Natural Sources of Water Supply. Utility district intake and water treatment plant locations are shown on the map in Figure 3.1, Water Source Intakes & Water Treatment Plants. Pictures of the existing water supply sources for the North Central TN study area are shown in figures 3.2 through 3.9.

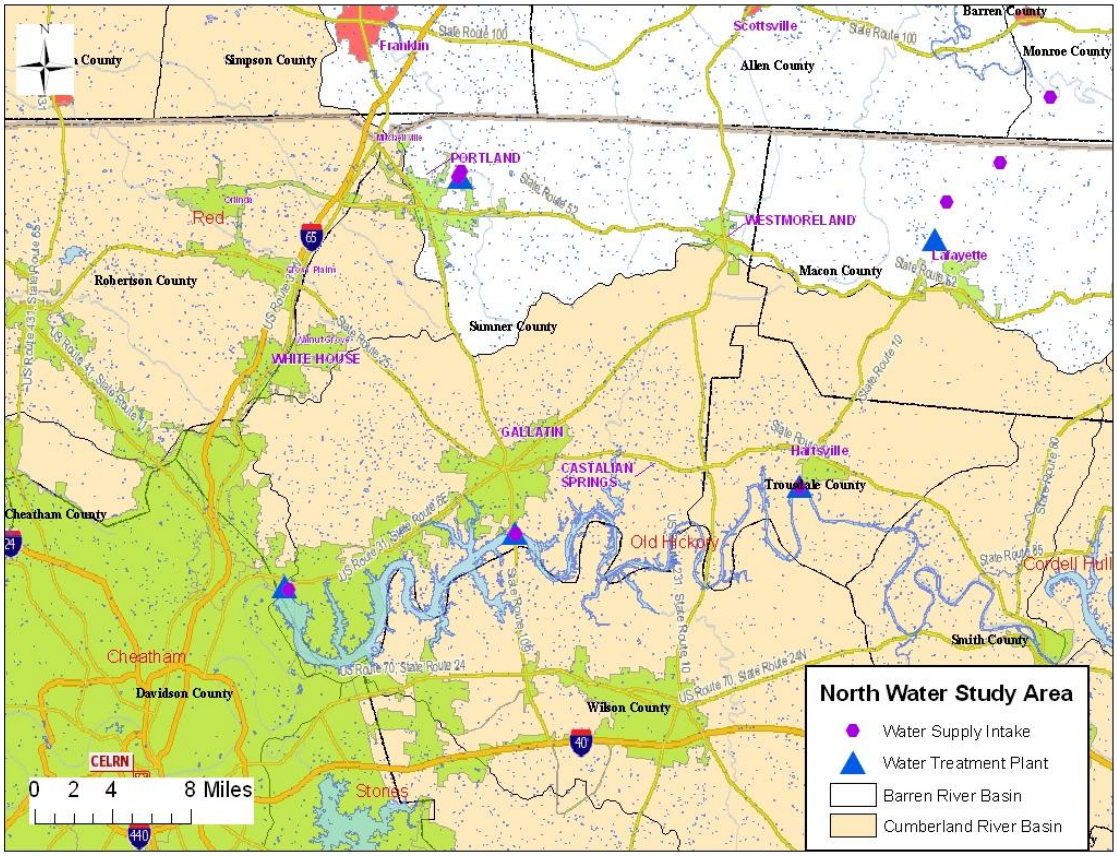
Not all of the utility systems in the North Central TN Study Area are situated to be able to economically take their supply directly from the Cumberland River or its reservoirs. Many systems utilize tributary streams to the Cumberland River or, in some cases, ground water sources.

TABLE 3-1

NATURAL SOURCES OF WATER SUPPLY

Utility	**Water Supply Source**	**Storage Capacity (MG)**
Gallatin	Cumberland River-Old Hickory Lake	152,000
Hartsville	Cumberland River-Old Hickory Lake	-
Lafayette	Whites Spring (Primary), Adams Spring (Secondary), and Barren River (Emergency)	-
Portland	West Fork Drakes Creek (Primary)	-
	Portland City Lake (Emergency)	115.7
White House	Cumberland River-Old Hickory Lake	152,000

Figure 3.1
Water Source Intakes & Water Treatment Plants



3.1.1 Surface Water Sources

Surface water utilized for water supply in the North Central TN Study Area includes surface streams, a large reservoir, and small impoundments intended to serve one city or area. The Cumberland River, Barren River, and West Fork Drakes Creek are the only streams that serve as water sources for the study area. Old Hickory Lake is the only reservoir and Portland City Lake (emergency source) is the only impoundment that serves as a water source for the study area.

West Fork Drakes Creek drains an area of about 62.5 square miles above the Portland U.D. intake.

Portland City Lake has an average depth of 30 feet, a surface area of 12 acres, a capacity of 355 acre-ft (115.7 MG), and a drainage area of 5.4 square miles. Portland City Lake has an uncontrolled emergency spillway.

Old Hickory Lake is located in portions of Davidson, Sumner, Wilson, Trousdale, and Smith Counties. The primary purpose of Old Hickory is for navigation and hydropower. Additional operating purposes are for recreation, fish and wildlife, water quality, and water supply. Although storage space is not allocated for water supply on either a permanent or temporary basis, water is being withdrawn for municipal and industrial purposes. During drought, consideration is given to keeping the lake level above supply pipe intakes. The average storage capacity of Old Hickory Lake is 467,000 acre-feet (152,000 MG). The minimum and normal tail water surface elevations are 382′ and 385‘, respectively. The minimum and normal headwater surface elevations are 442′ and 445′. The water surface elevation behind Old Hickory Dam is normally maintained within the hydropower pool limits and all normal releases are made through the turbines. Flood flows are passed through gates atop the 355′ long spillway.

Figure 3.2
Portland, West Fork Drakes Creek – Primary Source

Figure 3.3
Portland City Lake – Emergency Source

Figure 3.4
Lafayette Whites Spring Intake – Primary Source

Figure 3.5
Lafayette Adams Spring Intake- Secondary Source

Figure 3.6
Lafayette Barren River Intake – Emergency Source

Figure 3.7
Gallatin Cumberland River-Old Hickory Lake Intake

Figure 3.8
Hartsville/Trousdale Cumberland River Intake

Figure 3.9
White House Old Hickory Lake Intake

3.1.2 Ground Water Sources

For the North Central TN Study Area, the primary sources of ground water are springs. There are two different ground water sources in the study area. The springs, Whites Spring and Adams Spring, are both utilized by Lafayette U.D. and are the primary and secondary water supply source, respectively, for that utility district.

3.2 WATER SUPPLY SYSTEMS

There are presently seven major water systems in the North Central TN Study Area. Some of these systems serve as both suppliers and distributors while others are wholesale water providers. Table 3-2A, Water Supply Systems, presents the water systems and identifies the suppliers for each system. Treatment capacities are given for those systems which have their own water treatment plants. Table 3-2B, Size of Water System Connections, presents the pipe sizes connecting the utility districts to each other. A GIS map showing the utility districts' water lines and utility inter-connections are presented in Figure 3.10, Water Supply Systems.

3.2.1 Utility District Service Areas

Castalian Springs/Bethpage U.D. serves the towns of Castalian Springs, Bethpage, and portions of Sumner County (Figure 3.10). Castalian Springs and Bethpage are located in the Cumberland River Basin.

Gallatin U.D. serves the town of Gallatin and portions of Sumner County (Figure 3.10). Gallatin is located in the Cumberland River Basin.

Hartsville/Trousdale U.D. serves the town of Hartsville and portions of Trousdale, Sumner, Macon, and Smith Counties (Figure 3.10). Hartsville/Trousdale U.D. is located in the Cumberland River Basin.

Lafayette U.D. serves the town of Lafayette and portions of Macon County (Figure 3.10). Lafayette U.D. provides services in both the Cumberland River Basin and the Barren River Basin.

Portland U.D. serves the town of Portland and portions of northwest Sumner and northeast Robertson Counties (Figure 3.10). Portland U.D. provides services in both the Cumberland River Basin and the Barren River Basin.

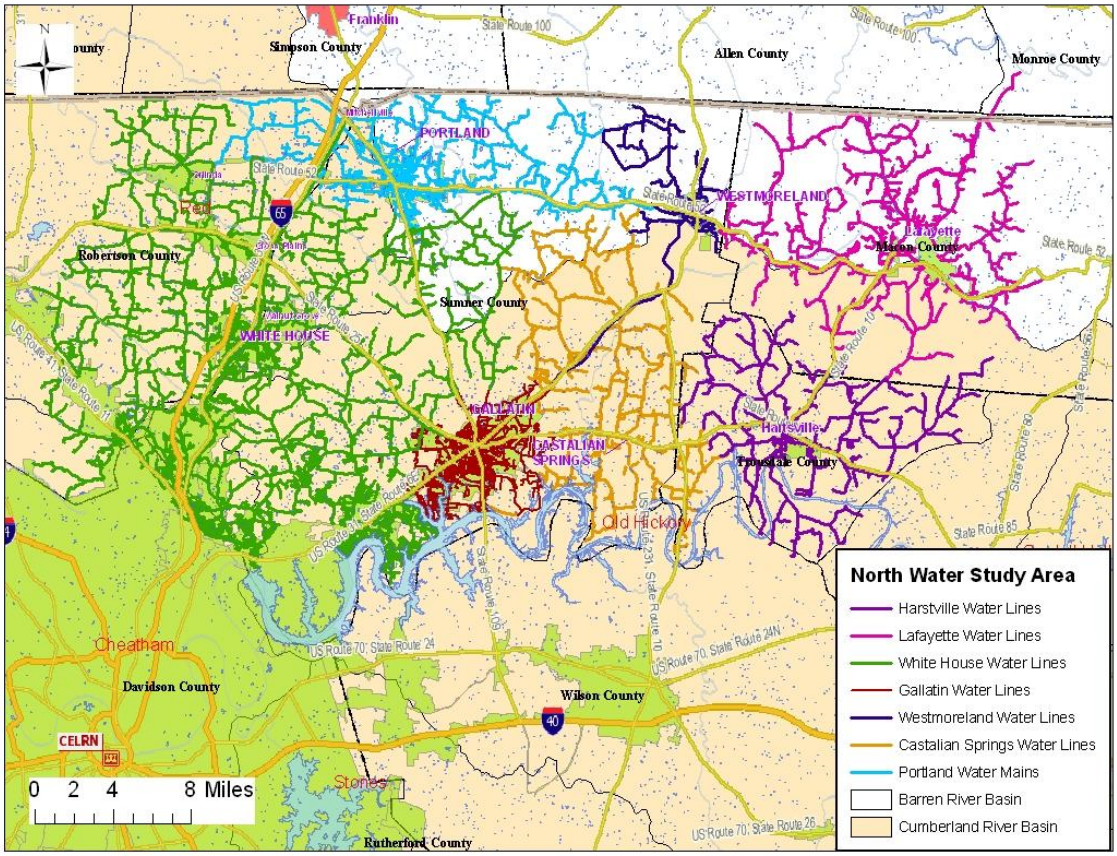
Westmoreland U.D. serves the town of Westmoreland and portions of Macon and Sumner Counties (Figure 3.10). Westmoreland U.D. provides services in both the Cumberland River Basin and the Barren River Basin.

White House U.D. serves the town of White House and portions of Robertson, Sumner, and Davidson Counties (Figure 3.10). White House U.D. is located in the Cumberland River Basin.

3.2.2 Utility District Water Supply Systems

Castalian Springs/Bethpage U.D. is a wholesale water provider and purchases all of their water supply from Gallatin, Hartsville, and Westmoreland, with the majority coming from Gallatin. Castalian Springs/Bethpage U.D. has a 1.45 million gallon storage capacity which provides 38.9 hours of supply based on average gross water use. The utility district is not certain of the ultimate capacity of their inter-connections to the utility districts from which they purchase water.

Figure 3.10
Water Supply Systems



Gallatin U.D. withdraws all of their water supply from the Cumberland River-Old Hickory Lake. Gallatin has two intakes built in 1954 located in the original channel of the Cumberland River prior to the lake being impounded. The depths of the intakes are 13’ and 28’ below the normal lake elevation of 445’. The original intake, built in 1925, still exists but is not utilized. Gallatin sells water daily to Castalian Springs and Westmoreland. White House is also connected to Gallatin and they purchase water only during emergencies; up to 1 MGD during dry summer months to fulfill their water demand. The capacities of the inter-connections from other utilities to Gallatin are 0.75 MGD to Westmoreland, 1.5 MGD to Castalian Springs/Bethpage, and 1 MGD to White House. Gallatin has a 13.5 million gallon storage capacity which provides 56.8 hours of supply based on average gross water use.

TABLE 3-2A

WATER SUPPLY SYSTEMS

WATER SYSTEMS	TREATMENT PLANT CAPACITY (mgd)	IMPOUNDMENTS/ RESERVOIRS/ SUPPLIERS	Average Withdrawal (mgd)	Water Purchased (mgd)	Water Sold (mgd)	Gross Water Use (mgd)
Castalian Springs-Bethpage U.D.	-	Gallatin (seller)	-	0.861	-	0.895
		Hartsville (seller)	-	0.0167	-	
		Westmoreland (seller)	-	0.0174	-	
Gallatin	16.1	Cumberland-Old Hickory Lake	7	-	-	5.7
		Castalian Springs/Bethpage (buyer)	-	-	0.861	
		Westmoreland (buyer)	-	-	0.4	
		White House (summer buyer)	-	-	-	-
Hartsville/Trousdale	1.7	Cumberland River	0.9	-	-	0.845
		Castalian Springs/Bethpage (buyer)	-	-	0.0167	
		South Side U.D. (buyer)	-	-	0.0284	
		Cordell Hull U.D. (buyer)	-	-	0.01	
Lafayette	2.4	Whites Spring	1	-	-	1.3
		Adams Spring	0.3	-	-	
		Barren River (emergency)	-	-	-	
Portland	3	Portland City Lake	0.5 (2 months per year)	-	-	2
		West Fork Drakes Creek	2 (10 months per year), 1.5 (2 months per year)	-	-	
Westmoreland	-	Gallatin (seller)	-	0.4		0.383
		Castalian Springs/Bethpage (buyer)	-	-	0.0167	
White House	20	Old Hickory Lake	10	-	-	10
		Gallatin (seller)	-	1 (summer)	-	
		Springfield (seller)	-	0.25 (summer)	-	
		Simpson County, KY (buyer)	-	-	1.6 (summer)	

TABLE 3-2B

Water System Connections

Utility Districts	Connection Size
Gallatin & Castalian Springs	4"
Gallatin & Westmoreland	10"
Gallatin & White House	6"
Portland & White House	6"
Portland & Westmoreland	4"
Hartsville & Lafayette	6"
Hartsville & Castalian Springs	3"
Lafayette & Westmoreland	6"
Castalian Springs & Westmoreland	6"

Hartsville/Trousdale U.D. withdraws all of their water supply from the Cumberland River. They sell water daily to Castalian Springs/Bethpage U.D., South Side U.D., and Cordell Hull U.D. Hartsville/Trousdale also sells water to Lafayette during emergencies. Due to the elevation of Lafayette, the capacity of the inter-connection from Hartsville is 20,000 GPD. The capacities of the inter-connections to the other utility districts are unknown to the Hartsville/Trousdale U.D. Hartsville/Trousdale U.D. has a storage capacity of 2.65 million gallons which provides 75.3 hours of supply based on average gross water use.

Lafayette U.D. withdraws their water supply from three sources; Whites Spring, Adams Spring, and the Barren River. The majority of their water supply is drawn from Whites Spring, 1 MGD, and an average of 0.3 MGD from Adams Spring. The Barren River intake is for emergency use only. They are also connected to Hartsville, Westmoreland, and Red Boiling Springs. Lafayette purchases water from Hartsville and Westmoreland only during emergencies. They also sell water to Red Boiling Spring and Westmoreland during emergencies. Under contract, the maximum volume of water that Lafayette is allowed to sell to Westmoreland and Red Boiling Springs is 200,000 GPD each. The full capacity of

the inter-connections to other utilities is unknown to Lafayette. Lafayette has a storage capacity of 1.3 million gallons which provides 24 hours of supply based on average gross water use.

Portland withdraws the majority of their water from West Fork Drakes Creek and, on average of two months of the year during the summer to meet their requirements; they withdraw water from Portland City Lake. Portland City Lake is used as an emergency supply when flow in West Fork Drakes Creek is too low to support water supply withdrawals. Portland U.D. can withdraw from one source but not both, since Portland City Lake is well above the surface level of the creek, and releasing water from the lake into the treatment plant pump station results in some backflows through the intake into the creek. Since water quality in Portland City Lake is generally poorer than water quality in Drakes Creek, it is used only as an emergency supply during droughts. Portland City Lake and West Fork Drakes Creek are located in the Barren River Basin. Portland also has an emergency connection to White House U.D., the south and west end of the system, and Westmoreland U.D. Portland has a 500,000 gallon clear well at the water plant and has 2.45 million gallons of tank storage which provides 35.4 hours of supply based on average gross water use.

Westmoreland is a wholesale water provider and purchases all of their water supply. They buy water from Gallatin and sell water to Castalian Springs. Westmoreland sells water to Portland only during emergencies and they purchase/sell water with Lafayette during emergencies. Portland has not bought water from Westmoreland for over four years. Westmoreland has two 500,000 gallon tanks for water storage which provides 62.7 hours of supply based on average gross water use.

White House U.D. withdraws their water supply from Old Hickory Lake. They have three intakes located on Old Hickory Lake in Hendersonville, TN. On peak days in the summer, White House will purchase water from Gallatin and Springfield. On average they purchase 1 MGD from Gallatin and 0.25 MGD from Springfield during this time to fulfill their water demand. White House sells, on average, 1.6 MGD of water to Simpson County, Kentucky during dry summer months. White House has a 14 million gallon storage capacity which provides 33.6 hours of supply based on average gross water use.

3.2.3 Inter-Basin Transfer Permits

Some of the utility districts in the study area provide services in the Lower Cumberland River watershed and the Barren River watershed. These utility districts must have an inter-basin transfer permit to provide these services. The utility districts with these permits, originating watershed, receiving watershed, and quantity permitted are presented in Table 3-2C, Inter-Basin Transfer Permits.

TABLE 3-2C

INTER-BASIN TRNASFER PERMITS

Utility District	**Originating Watershed**	**Receiving Watershed**	**Quantity Permitted (MGD)**
Gallatin U.D.	Lower Cumberland River	Upper Cumberland River	0.75
Lafayette U.D.	Barren River	Barren River	0.25
White House U.D.	Lower Cumberland River	Barren River	1.751

Gallatin has an inter-basin transfer permit allowing for the sale of a maximum of 0.75 MGD to Westmoreland which is in the Barren River watershed.
Lafayette has an inter-basin transfer permit that allows them to withdraw a maximum of 0.250 MGD from the Barren River.

White House has an inter-basin transfer permit that allows them to sell water to Portland and Simpson County, Kentucky because both utility districts provide services in the Barren River watershed. The transfer rate for White House is composed 1.001 MGD that was grand-fathered in plus 0.75 MGD that was permitted, for a total inter-basin transfer rate of 1.751 MGD.

3.2.4 Water Quality Issues

All of the utility districts with water treatment plants in the study area use the conventional sand filtration method

for their water treatment. White House U.D. recently added a membrane treatment to their system.

Gallatin and Hartsville both anticipate having trouble meeting drinking water regulations due to water quality issues. Gallatin anticipates having trouble with stage two DBP (disinfection by-products), haloacetic acids and total trihalomethanes requirements. Hartsville has historically had trouble with DBP, but has no current violations. Castalian Springs/Bethpage, Lafayette, White House, and Portland have no current violations and do not anticipate having trouble meeting drinking water regulations in the future.

3.2.5 Plans for Expansion of Water Systems

Castalian Springs/Bethpage plans to expand their existing distribution system. They broke ground on December 11, 2008 to extend lines to Phillips Hollow, off Hwy 231. The expected completion date is July 9, 2009. Macon County recently proposed expanding the distribution system past Phillips Hollow into Macon County. This would add 30-35 additional customers that are not able to be served by the Lafayette U.D. This is currently only a proposal.

Gallatin plans to expand their water treatment plant when gross water use reaches 10 MGD (estimated next 20 to 30 years.)

Hartsville/Trousdale has proposed a new water treatment plant and it is in design phase. The new treatment plant will replace the existing conventional water treatment plant with a new membrane filtration plant. The new plant will be located on Puryears Bend Road and there will be an installation of new raw water pumps and approximately 4,000 linear feet of 16 inch raw water line from the existing intake. They will tie into the existing distribution by installing approximately 4,000 linear feet of 16 inch finished water line. Initial raw water demand should not increase appreciably, but demands may increase to 6 MGD or more over the next twenty years. The primary beneficiary of the new water plant will be prisoners and employees at the new Corrections Corporation of America prison. Macon County plans to connect with Hartsville to supply water to 50 more customers when the new plant is operational. Lafayette plans to purchase 1 MGD from the new water plant

when it is operational and therefore can stop purchasing water from Westmoreland during emergencies.

Westmoreland broke ground on February 26, 2009 to extend 26,000 feet of 6 inch pipe to Dutch Creek Rd. They expect the project to be complete in 90 days from the ground breaking.

White House has plans for expanding treatment and distribution in their district (Details of this expansion have not yet been received). When White House reaches 90% of capacity they will upgrade their water treatment plant. They are currently at 80% of capacity. In the year 2013 a new plant is expected to be online with an increase in capacity of 4 MGD.

3.2.5.1 Limiting Factors of Expansion

Castalian Springs/Bethpage and Hartsville both claim that money is their limiting factor for expansion of their existing distribution system. At the same time, Gallatin cannot extent service into areas controlled by other utility districts. The limiting factors of expansion for Portland are limited raw water supply and small rural line sizes. White House and Castalian Springs do not have any current limiting factors for expansion. One goal of Phase II of this study is to determine if water availability is a limiting factor.

3.2.5.2 Environmental Impact of Expansion

None of the utility districts are aware of the environmental impacts of that may result from increased water withdrawals from existing sources, expansion of treatment plant capacity or distribution system, or development of new water supply sources.

Portland was denied an expansion permit by TDEC in 2007. TDEC determined that the proposed degradation of high quality waters (in Caney Fork Creek) was not justified as a result of necessary economic or social development and that there were practicable alternatives available.

3.3 EXISTING WATER DEMAND

Existing demand for the current population, the number of utility connections, the number of municipal and industrial

connections, current percent of water produced that is billed, and system losses within the planning region are shown in Table 3-3, Existing Demand. The approximate population served for each U.D. was calculated by taking the average household size from the 2000 U.S. Census and multiplying it by the number of residential accounts in the service areas. In this phase of the study, the amount (MGD) of water billed to the different account types has not been determined for all of the utility districts.

Castalian Springs/Bethpage U.D. serves mainly residential accounts. The district serves only three convenience stores and one elementary school. They do not bill their water separately for these accounts. The average household size for the Castalian Springs/Bethpage and surrounding Sumner County area is 2.64 persons.

TABLE 3-3

EXISTING DEMAND

Utility	Approx. Pop. Served	# of Accounts	Residential Accounts	Commercial Accounts	Industrial Accounts	Other Accounts	Avg. Quantity of Water Billed (MGD)	Estimate of Water Losses
Castalian Springs-Bethpage	9,958	3,772	-	-	-	-	0.66	26%
Gallatin	27,247	13,164	11,353	1,270	-	541	5.3	7%
Hartsville	7,140	2,800	-	-	-	-	0.55	35%
Lafayette	12,462	5,941	5,442	480	17	2	1	20%
Portland	16,005	6,613	6,109	50	454	-	1.4	30%
Westmoreland	3,450	1,480	1,327	118	1	-	0.29	30%
White House	76,464	28,671	27,505	1045	38	83 (Government)	7.5	32%

Gallatin serves residential, commercial, and other accounts such as sprinkler systems. The majority of Gallatin's water is billed to residential accounts (80%-90%). The rest of the water billed is to commercial/other accounts. The average household size for the Gallatin service area is 2.40 persons.

Hartsville serves primarily residential accounts. They do not bill separately for other accounts and do not have many

commercial or industry accounts. The average household size for the Hartsville area is 2.55 persons.

Lafayette serves primarily residential accounts. The average household size for Lafayette is 2.29 persons.

Portland serves a majority of residential accounts and a small amount of commercial and industrial accounts. On average, ninety percent of Portland's water billed is to residential accounts, six percent to commercial accounts, and four percent to industrial accounts. The average household size for the Portland area is 2.62 persons.

Westmoreland serves a majority of residential accounts and a fair amount of industrial accounts. The average household size for the Westmoreland area is 2.60 persons.

White House serves a majority of residential accounts, a fair amount of commercial accounts, and a small amount of industrial/other accounts. The average household size of the White House area is 2.78 persons.

3.3.1 Self-Supplied Water Use in Study Area

All of the self supplied users in the study area are assumed to withdraw their water from groundwater sources. Since none of the utility districts provided their water use broken into different accounts, an average of 125 gallons per day per person was used to determine the estimated amount of water use by self supplied users in the study area.

Castalian Springs/Bethpage U.D. serves an area of roughly 124 square miles. Using 2000 U.S. Census data, it was determined that the service area has an approximate population of 20,040 persons. Since Castalian Springs/Bethpage U.D. serves an approximate population of 9,958, it was estimated that the population of self-supplied users in the service area is 10,082. With the average household size of 2.64 persons, the estimated number of potential new residential accounts is 3,819. With each person using an average of 125 GPD, the estimated amount of self supplied water use in the service area is 477,375 GPD.

Gallatin U.D. serves primarily the City of Gallatin and the approximate population served is roughly the same as the

approximate population of Gallatin. Therefore, it is estimated there are very few self supplied water users in the service area of Gallatin U.D.

Lafayette U.D. serves an area of roughly 163 square miles. Using 2000 U.S Census data, it was determined that the service area has an approximate population of 19,444. Since Lafayette U.D. serves an approximate population of 12,462, it was estimated that the population of self-supplied users in the service area is 6,982. With the average household size of 2.29 persons, the estimated number of potential new residential accounts is 3,049. With each person using an average of 125 GPD, the estimated amount of self supplied water use in the service area is 381,125 GPD.

Hartsville U.D. serves an area of roughly 113.4 square miles. Using 2000 U.S. Census data, it was determined that the service area has an approximate population of 11,528. Since Hartsville U.D. serves an approximate population of 7,140, it was estimated that the population of self-supplied users in the service area is 4,388. With the average household size of 2.55 persons, the estimated number of potential new residential accounts is 1,721. With each person using an average of 125 GPD, the estimated amount of self supplied water use in the service area is 548,500 GPD.

Portland U.D. serves an area of roughly 104 square miles. Using 2000 U.S. Census data, it was determined that the service area has an approximate population of 20,824. Since Portland U.D. serves an approximate population of 16,005, it was estimated that the population of self-supplied users in the service area is 4,819. With the average household size of 2.62 persons, the estimated number of potential new residential accounts is 1,839. With each person using an average of 125 GPD, the estimated amount of self supplied water use in the service area is 229,875 GPD.

Westmoreland U.D. serves an area of roughly 35 square miles. Using 2000 U.S. Census data, it was determined that the service area has an approximate population of 5,646. Since Westmoreland U.D. serves an approximate population of 3,450, it was estimated that the population of self-supplied users in the service area is 2,196. With the average household size of 2.60 persons, the estimated

number of potential new residential accounts is 845. With each person using an average of 125 GPD, the estimated amount of self supplied water use in the service area is 105,625 GPD.

White House U.D. serves an area of roughly 385 square miles. Using 2000 Census data, it was determined that the service area has an approximate population of 102,229. Since White House U.D. serves an approximate population of 76,464, it was estimated that the population of self-supplied users in the service area is 25,835. With the average household size of 2.78 persons, the estimated number of potential new residential accounts is 9,293. With each person using an average of 125 GPD, the estimated amount of self supplied water use in the service area is 1.162 MGD.

3.3.2 Unaccounted For Water Use

In any water system, it is inevitable that not all of the produced water reaches paying consumers. Water that is produced but not billed is referred to as Unmetered/Unaccounted for Water (UAW). Leakage typically represents the largest portion of UAW, but a significant portion of UAW can be attributed to a combination of unmetered connections, firefighting, meter error, line flushing, and/or accidental breaks. The approximate water loss for each utility is presented in Table 3.3, Existing Demand.

3.3.3 Water Shortages

Some of the utility systems in the study area experience shortages during periods of peak demand or face a situation where peak demand exceeds, or will exceed, local supply capabilities. Shortages may also occur due to inadequate treatment, transmission, or distribution capacity. These systems must supplement their supplies by further source development or water purchased from other systems.

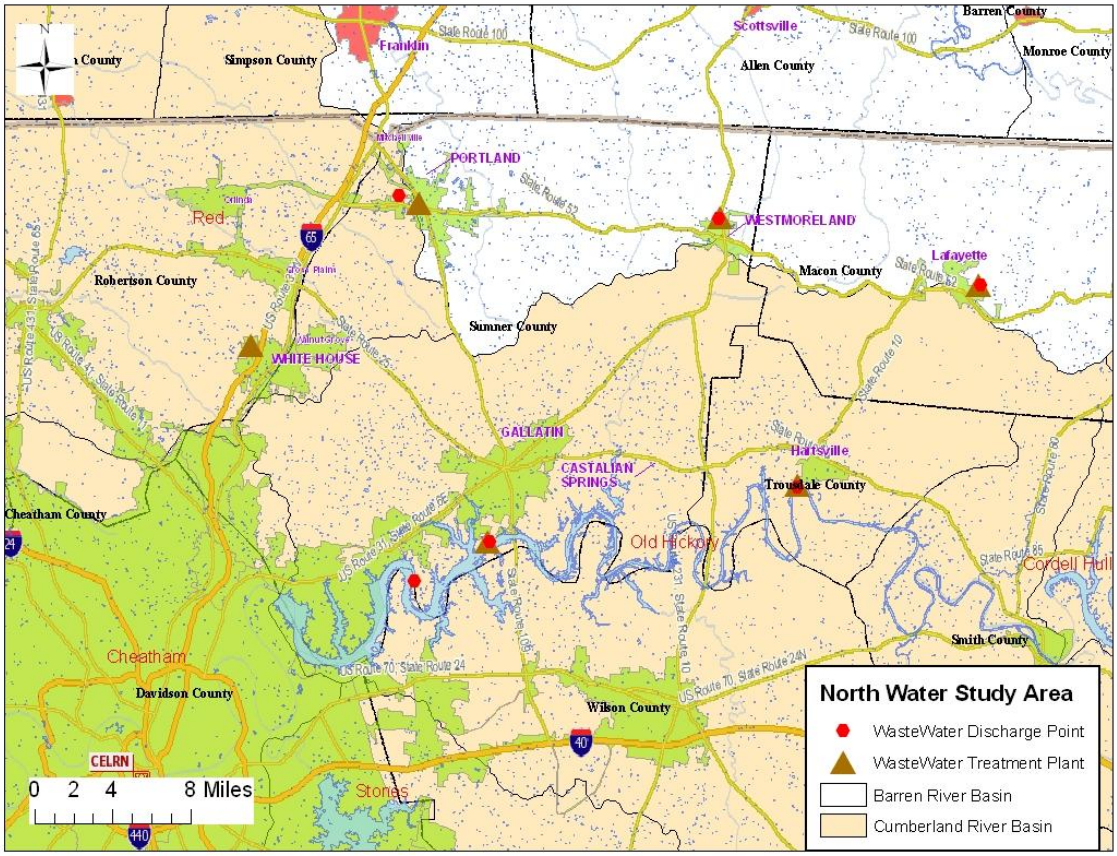
During the 2007 and 2008 droughts, Portland issued a mandatory cutback on water usage and utilized their emergency connections from White House U.D. They evaluated their lake source daily, to determine if declaration of emergency status was necessary. They came close to determining it was an emergency situation but ultimately did not have to.

Lafayette came close to failing to meet their water demand during the 2007 drought. The city issued water rationing orders and that proved effective, but they came very close to not meeting demand. Lafayette also purchased water from Westmoreland to supplement their demand.

3.4 EXISTING WASTE WATER SYSTEMS

Existing capacity of waste water treatment plants, number of sewer customers, method of discharge, location of treatment plants and discharge, and average daily discharge are presented in Table 3-4, Existing Waste Water Systems. Existing WWTP and wastewater discharge locations are presented in Figure 3.4, WWWTP and Discharge Locations. Some utility districts have sewer customers but no treatment plant. These districts pump their sewage to another utility district.

Figure 3.11
WWTP and Discharge Locations



Castalian Springs has no sewer customers or waste water treatment plant.

Gallatin's WWTP is currently being upgraded to treat 11.5 million gallons per day. The plant has a 25 million gallon hydraulic capacity. Gallatin discharges into the Cumberland River.

Hartsville has a 750,000 gallon capacity WWTP and discharges an average of 300,000 GPD to the Cumberland River. Hartsville is expanding their waste water treatment system from 0.75 MGD to 0.9 MGD. This system will be up and running in 2009.

Lafayette has a 4.5 MGD capacity WWTP and discharges an average of 700,000 GPD to Town Creek.
Portland's WWTP has a 3.8 MGD capacity and treats 1.9 MGD on average and 3.8 MGD for peak flow. Portland discharges into Sumner Branch, which flows into the Red River.

Westmoreland has a 300,000 GPD capacity WWTP and discharges an average of 250,000 GPD to Little Trammel Creek.

White House has a small package system located in the Tanasi Shores development in Gallatin. The treatment plant has a 40,000 GPD capacity. They discharge an average of 18,000 GPD to Old Hickory Lake. The majority of White House's wastewater is pumped to Metro Nashville and to the City of Gallatin; an average of 250,000 and 200,000 GPD, respectively.

TABLE 3-4

EXISTING WASTE WATER SYSTEMS

Utility	Existing Capacity of WW Treatment (mgd)	# Sewer Customers	Method of Discharge	Location of WWTP	Location of Discharge	Avg. Discharge (mgd)
Castalian Springs-Bethpage	-	-	-	-	-	-
Gallatin	11.5	10518	Direct Discharge	Lock 4 Road	Cumberland River	5.25
Hartsville	0.75	750	Direct Discharge	20 Waterplant Ln.	Cumberland River	0.3
Lafayette	4.5	2200	Direct Discharge	683 Bradley Hollow Rd.	1.2 Miles of Town Creek	0.7
Portland	3.8	3692	Direct Discharge	122A Morningside Dr.	Sumner Branch	1.9
Westmoreland	0.3	847	Direct Discharge	City Park Rd.	Little Trammel Creek	0.25
White House	0.04	2500	Majority Pumped to Gallatin and/or Nashville	725 Industrial Drive	Cumberland River	0.018

CHAPTER 4

GEOGRAPHIC INFORMATION SYSTEM (GIS)

4.1 GIS DATABASE

Data has been collected and implemented into a GIS database to house the information developed during the study. The GIS database includes basin outlines, all streams, springs, major water lines, intake locations, water treatment plants, wastewater plants, discharge points, and utility inter-connections of the South Cumberland Plateau Region. Hydrography data was incorporated from the USACE existing GIS database. The geographic coordinate system used for the projection of hydrography in the South Cumberland Plateau GIS database is GCS_North_American_1983 and the datum used is D_North_American_1983. Water treatment plants, water supply intakes, wastewater treatment plants, and wastewater discharge points for the utility districts in the study area were created in a GIS shapefile by using their physical locations from street addresses and/or latitudes and longitudes.

Castalian Springs/Bethpage U.D. provided a Computer Aided Design (CAD) drawing of their water system. The CAD drawing presented Castalian Springs/Bethpage's water lines, pipe sizes, fire hydrants, storage tanks, and water meters. This file was imported into the North Central TN GIS Database and converted into a GIS shapefile.

Gallatin U.D. provided GIS shapefiles presenting their water system. The shapefiles included Gallatin's water lines, pipe sizes, water tanks, and water intakes.

Hartsville U.D provided GIS shapefiles presenting their water system. The shapefiles included Hartsville's water lines, junctions, pumps, reservoirs, and tanks.

Lafayette U.D. provided GIS a shapefile through Professional Engineering Services, Inc. of Lafayette presenting their water system. The shapefile included Lafayette's water lines and pipe sizes.

Portland U.D. provided GIS shapefiles presenting their water system along with Westmoreland's water system. The shapefiles included Portland's intakes, fire hydrants,

inter-connection valves, water lines, pipe sizes, and Westmoreland's water lines and pipe sizes.

Westmoreland U.D. water lines and pipe sizes were provided in a GIS shapefile via Portland U.D.
White House U.D. provided a GIS shapefile presenting their water system. The shapefile included White House's water lines and pipe sizes.

CHAPTER 5

PROPOSED GEOGRAPHIC AREA OF PHASE II

5.1 PHASE II STUDY AREA

The utility districts of Portland, Westmoreland, Castalian Springs/Bethpage, Gallatin, and White House, and the geographic areas which they serve, are recommended for further investigation during Phase II of this regional planning pilot study. These utility districts were selected because of their many inter-connections with each other. The selected utility districts buy and sell water with each other on a daily basis in significant quantities.

Lafayette U.D. is not included in the Phase II study area because their inter-connections with the other U.D.'s are limited to emergency connections. Lafayette also has three of their own water supply sources with one being the Barren River. Lafayette plans to purchase water from Hartsville's new water plant when it is operational and this will eliminate the need for Lafayette to purchase water from Westmoreland during emergencies.

Hartsville U.D. is not included in the Phase II study area because they have their water supply source as the Cumberland River-Old Hickory Lake and do not face future water shortages. Hartsville also has only one non-emergency inter-connection within the study area (Castalian Springs) and the water Hartsville supplies is an insignificant portion of the total water demand of the region.

CHAPTER 6

REGIONAL WATER SUPPLY STUDIES

6.1 PREVIOUS WATER SUPPLY STUDIES

Gallatin, Harstville, and Castalian Springs/Bethpage have no previous Water Supply Studies.

The City of Portland conducted a preliminary engineering report of the Caney Fork Creek Reservoir Project prepared by Stephen L. Whiteside, P.E. on April 2006.

U.S. Army Corps of Engineers, Nashville District, conducted a Water Supply Study of Metropolitan Nashville and the ten county region surrounding Nashville that was prepared by Roy F. Weston, Inc. on September 1979.

Cumberland River Basin, Volume V, Old Hickory Water Control Manual, Prepared by Sverdrup Corporation for U.S. Army Corps of Engineers, Nashville District on December 1998.

2008 State Revolving Fund Program, Phase 1 – Water Expansion Project for City of Lafayette, Prepared by Professional Engineering Services, Inc. on May 2008.

Hartsville/Trousdale Co. Water & Sewer Department New Water Treatment Plant Development Project, Prepared by Barge Waggoner Sumner & Cannon, Inc. on February 17, 2009.

6.2 PROPOSED WATER SUPPLY STUDIES

U.S. Geological Survey prepared a ground-water resources report titled "Ground-Water Resources in the Metropolitan Region of Nashville, Tennessee" for use in the ten county study area. It was prepared by Don R. Rima and Patricia L. Goddard of the USGS is 1979.

CHAPTER 7

WATER SUPPLY STUDY CONTACTS

7.1 CONTACTS

The contacts for the North Central TN Study Area are presented in TABLE 7-1, Water Supply Study Contacts.

TABLE 7-1

WATER SUPPLY STUDY CONTACTS

Utility/ Organization	Address	City	Zip Code	Point of Contact	Phone	Fax	E-mail	Web Page
Castalian Springs/ Bethpage	3501-A Hwy. 31E	Bethpage	37022	Bennie Oldham	615-841-3724	615-841-3794	csbwud@nctc.com	www.csbwater.com
Gallatin	239 Hancock	Gallatin	37066	David Gregory	615-451-5922	615-452-0568	dgregory@gallatinutilities.com	www.gallatinutilities.com
Hartsville/ Trousdale	PO Box 66	Hartsville	37074	Penny Sutherland	615-374-3484	615-374-0559	jhsh20@hotmail.com	-
Lafayette	200 East Locust Street	Lafayette	37083	Gene Reid	615-666-2194	615-666-2922	greid@lafayettecityhall.org	www.lafayettetn.com
Portland	100 S. Russell St.	Portland	37148	Brian Goodwin	615-323-1437 & 615-325-6776	615-323-8297	bgoodwin@cityofportlandtn.gov	www.portlandtn.com
Westmoreland	PO Box 8100 (1001 Park St.)	Westmoreland	37186	Chris Carter	615-644-5171 & 615-644-3382	615-644-3950	westwater@nctc.com	-
White House	PO Box 608	White House	37188	Pat Harrell	615-672-9527	-	pharrell@whud.org	www.whud.org
Nashville USACE	PO Box 1070	Nashville	37202	Sue Ferguson	615-736-7192	615-736-7220	sue.l.feguson@usace.army.mil	http://www.orn.usace.army.mil/
Nashville USACE	PO Box 1070	Nashville	37202	Ben Rohrbach	615-736-7497	615-736-7220	ben.rohrbach@usace.army.mil	http://www.orn.usace.army.mil/
TDEC	401 Church St.	Nashville	37243	Elaine H. Boyd	615-532-0288	615-741-8858	elaine.boyd@state.tn.us	-
TDEC	401 Church St.	Nashville	37243	Robert L. Foster, Jr.	615-532-0155	-	robert.foster@state.tn.us	-
TDEC	401 Church St.	Nashville	37243	Paul E. Davis	615-532-0632	-	paul.estill.davis@state.tn.us	-